Rec'd PCT/PTO 22 JUN2001

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED / ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
P66760US0	
US APPLICATION NO. (If known, see 37 CFR 1.5)	09/857205

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP99/10262	22 December 1999	22 December 1998

TITLE OF INVENTION

ARRANGEMENT FOR SEPARATING EXCITATION LIGHT AND EMISSION LIGHT IN A MICROSCOPE

APPLICANT(S) FOR DO/EO/US

Ralf WOLLESCHENSKY

Applicant herein submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for Internatl. Preliminary Examination was made by the 19th month from earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the Internatl. Preliminary Examination report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
    International Search Report -EPO
    First Page of Publication
    International Preliminary Examination Report - with annexes

531 Rec'd PCT/ 22 JUN 2001

US APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/857205	PCT/EP99/10262	P66760US0

	CALCULATIONS	PTO USE ONLY
17. ☒ The following fees are submitted:		
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Internatl. prelim. examination fee paid to USPTO (37 CFR 1.492 (a) (1)) . . $690.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (2)) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) . . $710.00		
Neither international preliminary examination fee (37 CFR 1.492 (a) (3)) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO) **$1000.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492 (a) (4)) and all claims satisfied provisions of PCT Article 33(2)-(4) $100.00		
Search Report prepared by the EPO or JPO (37 CFR 1.492 (a) (5)) **$860.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of $130.00 for furnishing the **oath or declaration** later than ☐ **20** ☐ **30** months from the earliest claimed priority date (37 CFR 1.492(e)).	$	

Claims	**Number Filed**	**Number Extra**	Rate		
Total Claims	**54** - 20 =	-34-	x $18.00	$ 612.00	
Independent Claims	**7** - 3 =	**-4-**	x $80.00	$	
Multiple Dependent Claim(s) (if applicable)			+ $270.00	$ 320.00	
TOTAL OF ABOVE CALCULATIONS =				$ 1792.00	
Reduction by 1/2 for filing by **small entity**, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$ 1792.00	
Processing fee of $130 for furnishing the **English translation** later than ☐ **20** ☐ **30** months from the earliest claimed priority date (37 CFR 1.492(f))				$	
TOTAL NATIONAL FEE =				$ 1792.00	
Fee of $40.00 for recording the enclosed **assignment** (37 CFR 1.21(h)). Assignment must be accompanied by appropriate cover sheet (37 CFR 3.28, 3.31).				$ 40.00	
TOTAL FEES ENCLOSED =				$ 1832.00	
				Amt. to be refunded:	$
				Amt. charged:	$

a. ☒ A check in the amount of $ 1832.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. **06-1358** in the amount of $ ____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge my account any additional fees set forth in §1.492 during the pendency of this application, or credit any overpayment to Deposit Account No. **06-1358**. A duplicate copy of this sheet is enclosed.

SEND ALL CORRESPONDENCE TO:

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JPH&S 3/95

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	:	
Ralf WOLLESCHENSKY	:	
International Appl. No. PCT/EP99/10262	:	Art Unit: (not yet assigned)
International Filing Date: 22 December 1999	:	Examiner: (not yet assigned)
For: ARRANGEMENT FOR SEPARATING EXCITATION LIGHT AND EMISSION LIGHT IN A MICROSCOPE	:	Atty Docket: P66760US0

PRELIMINARY AMENDMENT

Box PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination, Applicant submits the following Amendment and Remarks.

It is not believed that fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that any fees are required for consideration of this paper and any papers associated with it (including fees for net addition of claims), such fees are hereby authorized to be charged to our Deposit Account No. 06-1358.

Kindly enter the following Amendment:

IN THE CLAIMS

Please cancel claims 1-11 (including the claims numbered 2a and 3a) without prejudice or disclaimer.

Please add the following new claims:

12. (New) A microscope having a microscope beam path and including a light diffracting element for the separation of excitation light and emission light in the microscope beam path.

13. (New) The microscope of claim 12, wherein the microscope is a laser scanning microscope.

14. (New) The microscope of claim 12, wherein the light diffracting element is traversed both by the excitation light and the emission light.

15. (New) The microscope of claim 14, wherein the light emitted by a sample comprises fractions of the excitation light and of wavelength-shifted fluorescence fractions.

16. (New) The microscope of claim 12, wherein the light diffracting element influences at least one excitation wavelength by diffraction, whereas other wavelengths emitted by a sample pass in uninfluenced form through the element and are thereby spatially separated from the excitation light.

17. (New) The microscope of claim 13, further including means for switching the light diffracting element by way of a frequency change from a first wavelength of a first laser to a second wavelength of a second laser.

18. (New) The microscope of claim 12, further including at least one optical element influencing the light direction provided in the excitation beam path upstream of the element and/or in the detection beam path downstream of the element in order to improve light fraction separation.

19. (New) The microscope of claim 12, wherein the light diffracting element comprises an AOTF.

20. (New) The microscope of claim 12, wherein the optical element comprises a reflection element.

21. (New) The microscope of claim 12, wherein the optical element. comprises a light refracting element

22. (New) A microscope having a microscope beam path and including a light diffracting element for the separation of excitation light and emission light in the microscope beam path and for regulating the excitation intensity.

23. (New) The microscope of claim 22, wherein the microscope is a laser scanning microscope.

24. (New) A microscope having a microscope beam path and including a plurality of light diffracting element for the separation of excitation light and emission light in the microscope beam path and for simultaneously or individually feeding in different wavelengths.

25. (New) The microscope of claim 24, wherein the microscope is a laser scanning microscope.

26. (New) The microscope of claim 24, wherein the light detecting elements comprise firstly an AOTF and then an AOM in the direction of the detection.

27. (New) The microscope of claim 24, wherein at least one of an AOTF and an AOM are used as light diffracting elements.

28. (New) A fluorescence microscope comprising:

a radiation source (L1, L2, L3) for irradiating a sample,

a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,

microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

an acousto-optical element (AOM, AOTF) for diffracting excitation light and with which it is possible to regulate an intensity of the diffracted excitation light, the acousto-optical element being positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1), wherein:

the emission light emitted by the sample has fractions of excitation light and fractions of wavelength-shifted fluorescence light,

excitation light emitted by the sample can be deflected in the direction of the radiation source by the acousto-optical device (AOM, AOTF), and

wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light, and wherein:

the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical element (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT) and

further comprising a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is located between the acousto-optical element and the detection device (DE, DT, NFT).

29. (New) The fluorescence microscope of claim 28, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

30. (New) The fluorescence microscope of claim 28, wherein the radiation source is a laser emitting excitation light.

31. (New) The fluorescence microscope of claim 28, further comprising at least one optical element influencing the light direction provided in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF) for the improved separation of the light fractions.

32. (New) The fluorescence microscope of claim 31, wherein the optical element comprises a reflection element (S1, S2, PS, S) selected from the group consisting of a mirror (S), a bimirror (S1, S2) and a vapourized prism (PS).

33. (New) The fluorescence microscope of claim 31, wherein the optical element comprises a light refracting element (P) which is located in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF).

34. (New) The fluorescence microscope of claim 33, wherein the light refracting element comprises an unvapourized prism (P).

35. (New) The fluorescence microscope of claim 32, further comprising a further optical element comprising a light refracting element (P) which is located in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF).

36. (New) The fluorescence microscope of claim 35, wherein the light refracting element comprises an unvapourized prism (P).

37. (New) A fluorescence microscope, comprising:

a radiation source (L1, L2, L3) which emits excitation light for irradiating a sample,

a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,

microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

an acousto-optical element (AOM, AOTF) for diffracting excitation light and which is positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1), wherein:

the emission light emitted by the sample has fractions of excitation light and fractions of wavelength-shifted fluorescence light,

excitation light emitted by the sample can be deflected in the direction of the radiation source by diffraction by the acousto-optical device (AOM, AOTF), and

wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light, and wherein:

the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical element (AOM, AOTF) can be detected by means of the detection device (DE, DT, NFT), and further comprising:

a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical element and the detection device (DE, DT, NFT), and

at least one light reflecting element (P) for influencing the light direction and for separating the light fractions, which is located in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF).

38. (New) The fluorescence microscope of claim 37, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

39. (New) The fluorescence microscope of claim 37, wherein the radiation source (L1, L2, L3) is a laser.

40. (New) The fluorescence microscope of claim 37, wherein the at least one light reflecting element (P) is an unvapourized prism (P).

41. (New) The fluorescence microscope of claim 28, wherein the acousto-optical elements (AOM, AOTF) comprise firstly an AOM and then an AOTF in the direction of the microscope optics (SC1, SC2, SCO, M1).

42. (New) The fluorescence microscope of claim 37, wherein the acousto-optical elements (AOM, AOTF) comprise firstly an AOM and then an AOTF in the direction of the microscope optics (SC1, SC2, SCO, M1).

43. (New) A fluorescence microscope, comprising:

a radiation source (L1, L2, L3) which emits excitation light for irradiating a sample,

a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,

microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

a plurality of acousto-optical elements (AOM, AOTF) for diffracting excitation light, which are so positioned between the radiation source and the microscope optics that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1), wherein:

in the direction of the microscope optics (SC1, SC2, SCO, M1) as acousto-optical elements (AOM, AOTF) are firstly provided an AOM and then an AOTF,

the emission light emitted by the sample has fractions of excitation light and fractions of wavelength-shifted fluorescence light,

excitation light emitted by the sample is deflectable by diffraction in the direction of the radiation source by the acousto-optical devices (AOM, AOTF), and

wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical elements (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light, and wherein:

the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical elements that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical elements (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT), and further comprising:

a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical elements and the detection device (DE, DT, NFT).

44. (New) The fluorescence microscope of claim 43, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

45. (New) The fluorescence microscope of claim 43, wherein the radiation source (L1, L2, L3) is a laser.

46. (New) The fluorescence microscope of claim 28, wherein at least one glass fibre is provided for feeding in excitation light.

47. (New) The fluorescence microscope of claim 37, wherein at least one glass fibre is provided for feeding in excitation light.

48. (New) The fluorescence microscope of claim 43, wherein at least one glass fibre is provided for feeding in excitation light.

49. (New) The fluorescence microscope of claim 43, further comprising at least one optical element influencing the light direction provided in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF) to bring about improved separation of the light fractions.

50. (New) The fluorescence microscope of claim 28, wherein:

the radiation source (L1, L2, L3) is constructed as a plurality of lasers (L1, L2, L3) having different wavelengths,

a plurality of the acousto-optical elements (AOM, AOTF) are provided and with each laser (L1, L2, L3) is associated at least one acousto-optical element (AOM, AOTF),

the different wavelengths by diffraction in the acousto-optical elements (AOM, AOTF) can be simultaneously or individually fed into a microscope beam path (SC1, SC2, SCO, M1), and

wavelength-shifted emission light and excitation light having in each case a different wavelength can be transmitted undiffracted through the respective acousto-optical elements (AOM, AOTF).

51. (New) The fluorescence microscope of claim 28, wherein the acousto-optical elements comprise at least one of an AOTF and an AOM.

52. (New) The fluorescence microscope of claim 50, wherein the excitation power of each laser (L1, L2, L3) is independently adjustable with the respective acousto-optical element (AOM, AOTF).

53. (New) The fluorescence microscope of claim 30, wherein the acousto-optical elements (AOM, AOTF) can be switched by a frequency change from a first wavelength of a first laser to a second wavelength of a second laser.

54. (New) The fluorescence microscope of claim 28, wherein the excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1) by diffraction at the acousto-optical element (AOM, AOTF) in the first diffraction order.

55. (New) The fluorescence microscope of claim 28, further comprising an excitation and detection pinhole (PH) located upstream of the microscope optics (SC1, SC2, SCO, M1).

56. (New) The fluorescence microscope of claim 50, wherein the radiation of the plurality of lasers (L1, L2, L3) in the direction of the microscope optics (SC1, SC2, SCO, M1) can be successively fed into the microscope beam path in a sequence based on decreasing wavelength.

57. (New) The fluorescence microscope of claim 28, wherein at least one of UV light, visible light and infrared light can be fed into the microscope beam path.

58. (New) A device for feeding light into a beam path of a microscope, comprising:

a plurality of light sources (L1, L2, L3), which emit light of different wavelengths, wherein:

a plurality of light diffracting elements is provided, the light diffracting elements being located on a common optical axis for combining the light of the plurality of light sources (L1, L2, L3), and

at least one light diffracting element associated is with each light source (L1, L2, L3), and wherein the different wavelengths by diffraction in the light diffracting elements can be simultaneously or individually fed into the common optical axis and are combinable in the common optical axis.

59. (New) The device of claim 58, wherein the microscope is a confocal fluorescence laser microscope.

60. (New) The device of claim 58, wherein the plurality of light diffracting elements comprise acousto-optical elements (AOM, AOTF).

61. (New) The device of claim 58, wherein the light diffracting elements are chosen from the group consisting of an AOTF and an AOM.

62. (New) The device of claim 61, wherein the acousto-optical elements (AOM, AOTF) comprise firstly an AOM and then an AOTF in the direction of the microscope optics (SC1, SC2, SCO, M1).

63. (New) The microscope of claim 12, wherein the microscope is a confocal microscope.

64. (New) The microscope of claim 22, wherein the microscope is a confocal microscope.

65. (New) The microscope of claim 24, wherein the microscope is a confocal microscope.

IN THE ABSTRACT

Please add the Abstract provided herewith as a separate sheet.

REMARKS

Claims 12-65 are pending in the application.

By the foregoing Amendment, claims 1-11 (including the claims numbered 2a and 3a) are cancelled without prejudice or disclaimer. New claims 12-65 are added. Attached hereto is a marked-up version of the claims showing the changes made thereto by the current Amendment. The attached page is titled "CLAIMS MARKED TO SHOW CHANGES."

These changes are believed not to introduce new matter, and entry of the Amendment is respectfully requested.

Conclusion

The application is now believed to be in condition for examination. Should any questions arise, the Examiner is invited to call the undersigned representative so that this case may receive an early Notice of Allowance.

Favorable consideration and allowance are earnestly solicited.

Respectfully submitted,

JACOBSON HOLMAN PLLC

Date: June 22, 2001

By: Allen S. Melser
By Nathaniel A. Humphreys R.N. 22742

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	:	
Ralf WOLLESCHENSKY	:	
International Appl. No. PCT/EP99/10262	:	Art Unit: (not yet assigned)
International Filing Date: 22 December 1999	:	Examiner: (not yet assigned)
For: ARRANGEMENT FOR SEPARATING EXCITATION LIGHT AND EMISSION LIGHT IN A MICROSCOPE	:	Atty Docket: P66760US0

CLAIMS MARKED TO SHOW CHANGES

In the Specification

(Another version of any replacement paragraph(s) or section heading(s) must be provided, on one or more pages separate from the amendment, marked up to show all the changes relative to the previous version of the paragraph(s). The changes may be shown by brackets (for deleted matter) or underlining (for added matter), or by any equivalent marking system. A marked up version does not have to be supplied for an added paragraph or a deleted paragraph as it is sufficient to state that a particular paragraph has been added, or deleted. See 37 CFR § 1.121.)

The paragraph at page _, lines _ has been amended as follows:

In the Claims

Claims 1-11 (including the claims numbered 2a and 3a) have been canceled without prejudice or disclaimer.

New claims 12-65 have been added as follows:

12. A microscope having a microscope beam path and including a light diffracting element for the separation of excitation light and emission light in the microscope beam path.

13. The microscope of claim 12, wherein the microscope is a laser scanning microscope.

14. The microscope of claim 12, wherein the light diffracting element is traversed both by the excitation light and the emission light.

15. The microscope of claim 14, wherein the light emitted by a sample comprises fractions of the excitation light and of wavelength-shifted fluorescence fractions.

16. The microscope of claim 12, wherein the light diffracting element influences at least one excitation wavelength by diffraction, whereas other wavelengths emitted by a sample pass in uninfluenced form through the element and are thereby spatially separated from the excitation light.

17. The microscope of claim 13, further including means for switching the light diffracting element by way of a frequency change from a first wavelength of a first laser to a second wavelength of a second laser.

18. The microscope of claim 12, further including at least one optical element influencing the light direction provided in the excitation beam path upstream of the element and/or in the detection beam path downstream of the element in order to improve light fraction separation.

19. The microscope of claim 12, wherein the light diffracting element comprises an AOTF.

20. The microscope of claim 12, wherein the optical element comprises a reflection element.

21. The microscope of claim 12, wherein the optical element. comprises a light refracting element

22. A microscope having a microscope beam path and including a light diffracting element for the separation of excitation light and emission light in the microscope beam path and for regulating the excitation intensity.

23. The microscope of claim 22, wherein the microscope is a laser scanning microscope.

24. A microscope having a microscope beam path and including a plurality of light diffracting element for the separation of excitation light and emission light in the microscope beam path and for simultaneously or individually feeding in different wavelengths.

25. The microscope of claim 24, wherein the microscope is a laser scanning microscope.

26. The microscope of claim 24, wherein the light detecting elements comprise firstly an AOTF and then an AOM in the direction of the detection.

27. The microscope of claim 24, wherein at least one of an AOTF and an AOM are used as light diffracting elements.

28. A fluorescence microscope comprising:

a radiation source (L1, L2, L3) for irradiating a sample,

a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,

microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

an acousto-optical element (AOM, AOTF) for diffracting excitation light and with which it is possible to regulate an intensity of the diffracted excitation light, the acousto-optical element being positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1), wherein:

the emission light emitted by the sample has fractions of excitation light and fractions of wavelength-shifted fluorescence light,

excitation light emitted by the sample can be deflected in the direction of the radiation source by the acousto-optical device (AOM, AOTF), and

wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light, and wherein:

the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical element (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT) and

further comprising a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is located between the acousto-optical element and the detection device (DE, DT, NFT).

29. The fluorescence microscope of claim 28, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

30. The fluorescence microscope of claim 28, wherein the radiation source is a laser emitting excitation light.

31. The fluorescence microscope of claim 28, further comprising at least one optical element influencing the light direction provided in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF) for the improved separation of the light fractions.

32. The fluorescence microscope of claim 31, wherein the optical element comprises a reflection element (S1, S2, PS, S) selected from the group consisting of a mirror (S), a bimirror (S1, S2) and a vapourized prism (PS).

33. The fluorescence microscope of claim 31, wherein the optical element comprises a light refracting element (P) which is located in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF).

34. The fluorescence microscope of claim 33, wherein the light refracting element comprises an unvapourized prism (P).

35. The fluorescence microscope of claim 32, further comprising a further optical element comprising a light refracting element (P) which is located in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF).

36. The fluorescence microscope of claim 35, wherein the light refracting element comprises an unvapourized prism (P).

37. A fluorescence microscope, comprising:

a radiation source (L1, L2, L3) which emits excitation light for irradiating a sample,

a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,

microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

an acousto-optical element (AOM, AOTF) for diffracting excitation light and which is positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1), wherein:

the emission light emitted by the sample has fractions of excitation light and fractions of wavelength-shifted fluorescence light,

excitation light emitted by the sample can be deflected in the direction of the radiation source by diffraction by the acousto-optical device (AOM, AOTF), and

wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light, and wherein:

the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical element (AOM, AOTF) can be detected by means of the detection device (DE, DT, NFT), and further comprising:

a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical element and the detection device (DE, DT, NFT), and

at least one light reflecting element (P) for influencing the light direction and for separating the light fractions, which is located in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF).

38. The fluorescence microscope of claim 37, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

39. The fluorescence microscope of claim 37, wherein the radiation source (L1, L2, L3) is a laser.

40. The fluorescence microscope of claim 37, wherein the at least one light reflecting element (P) is an unvapourized prism (P).

41. The fluorescence microscope of claim 28, wherein the acousto-optical elements (AOM, AOTF) comprise firstly an AOM and then an AOTF in the direction of the microscope optics (SC1, SC2, SCO, M1).

42. The fluorescence microscope of claim 37, wherein the acousto-optical elements (AOM, AOTF) comprise firstly an AOM and then an AOTF in the direction of the microscope optics (SC1, SC2, SCO, M1).

43. A fluorescence microscope, comprising:

a radiation source (L1, L2, L3) which emits excitation light for irradiating a sample,

a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,

microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

a plurality of acousto-optical elements (AOM, AOTF) for diffracting excitation light, which are so positioned between the radiation source and the microscope optics that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1), wherein:

in the direction of the microscope optics (SC1, SC2, SCO, M1) as acousto-optical elements (AOM, AOTF) are firstly provided an AOM and then an AOTF,

the emission light emitted by the sample has fractions of excitation light and fractions of wavelength-shifted fluorescence light,

excitation light emitted by the sample is deflectable by diffraction in the direction of the radiation source by the acousto-optical devices (AOM, AOTF), and

wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical elements (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light, and wherein:

the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical elements that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical elements (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT), and further comprising:

a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical elements and the detection device (DE, DT, NFT).

44. The fluorescence microscope of claim 43, wherein the fluorescence microscope is a confocal fluorescence laser microscope.

45. The fluorescence microscope of claim 43, wherein the radiation source (L1, L2, L3) is a laser.

46. The fluorescence microscope of claim 28, wherein at least one glass fibre is provided for feeding in excitation light.

47. The fluorescence microscope of claim 37, wherein at least one glass fibre is provided for feeding in excitation light.

48. The fluorescence microscope of claim 43, wherein at least one glass fibre is provided for feeding in excitation light.

49. The fluorescence microscope of claim 43, further comprising at least one optical element influencing the light direction provided in at least one of an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and a detection beam path downstream of the acousto-optical element (AOM, AOTF) to bring about improved separation of the light fractions.

50. The fluorescence microscope of claim 28, wherein:

the radiation source (L1, L2, L3) is constructed as a plurality of lasers (L1, L2, L3) having different wavelengths,

a plurality of the acousto-optical elements (AOM, AOTF) are provided and with each laser (L1, L2, L3) is associated at least one acousto-optical element (AOM, AOTF),

the different wavelengths by diffraction in the acousto-optical elements (AOM, AOTF) can be simultaneously or individually fed into a microscope beam path (SC1, SC2, SCO, M1), and

wavelength-shifted emission light and excitation light having in each case a different wavelength can be transmitted undiffracted through the respective acousto-optical elements (AOM, AOTF).

51. The fluorescence microscope of claim 28, wherein the acousto-optical elements comprise at least one of an AOTF and an AOM.

52. The fluorescence microscope of claim 50, wherein the excitation power of each laser (L1, L2, L3) is independently adjustable with the respective acousto-optical element (AOM, AOTF).

53. The fluorescence microscope of claim 30, wherein the acousto-optical elements (AOM, AOTF) can be switched by a frequency change from a first wavelength of a first laser to a second wavelength of a second laser.

54. The fluorescence microscope of claim 28, wherein the excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1) by diffraction at the acousto-optical element (AOM, AOTF) in the first diffraction order.

55. The fluorescence microscope of claim 28, further comprising an excitation and detection pinhole (PH) located upstream of the microscope optics (SC1, SC2, SCO, M1).

56. The fluorescence microscope of claim 50, wherein the radiation of the plurality of lasers (L1, L2, L3) in the direction of the microscope optics (SC1, SC2, SCO, M1) can be successively fed into the microscope beam path in a sequence based on decreasing wavelength.

57. The fluorescence microscope of claim 28, wherein at least one of UV light, visible light and infrared light can be fed into the microscope beam path.

58. A device for feeding light into a beam path of a microscope, comprising:

a plurality of light sources (L1, L2, L3), which emit light of different wavelengths, wherein:

a plurality of light diffracting elements is provided, the light diffracting elements being located on a common optical axis for combining the light of the plurality of light sources (L1, L2, L3), and

at least one light diffracting element associated is with each light source (L1, L2, L3), and wherein the different wavelengths by diffraction in the light diffracting elements can be simultaneously or individually fed into the common optical axis and are combinable in the common optical axis.

59. The device of claim 58, wherein the microscope is a confocal fluorescence laser microscope.

60. The device of claim 58, wherein the plurality of light diffracting elements comprise acousto-optical elements (AOM, AOTF).

61. The device of claim 58, wherein the light diffracting elements are chosen from the group consisting of an AOTF and an AOM.

62. The device of claim 61, wherein the acousto-optical elements (AOM, AOTF) comprise firstly an AOM and then an AOTF in the direction of the microscope optics (SC1, SC2, SCO, M1).

63. The microscope of claim 12, wherein the microscope is a confocal microscope.

64. The microscope of claim 22, wherein the microscope is a confocal microscope.

65. The microscope of claim 24, wherein the microscope is a confocal microscope.

ABSTRACT

Arrangement of a light diffracting element for the separation of excitation light and emission light in a microscope beam path, preferably in a confocal microscope and in particular in a laser scanning microscope, wherein the light diffracting element is traversed both by the excitation light and the emission light and at least one excitation wavelength is influenced by diffraction, whereas other wavelengths emitted by the sample traverse the element in uninfluenced form and consequently are separated spatially from the excitation light.

Title:

ARRANGEMENT FOR SEPARATING EXCITATION LIGHT AND EMISSION LIGHT IN A MICROSCOPE

[0001] Figs. 1 to 3 illustrate in exemplified manner arrangements according to the invention.

[0002] In Fig. 1 by means of a mirror SP and a beam splitter ST the light (excitation light) of two lasers L1, L2 having different wavelengths is fed into a common beam path, which is reflected on the side S1 of a vapourized prism in the direction of an AOTF (acousto-optical tunable filter). The excitation light is introduced into the AOTF and light diffracted in the first order for the wavelength set by means of the AOTF control frequency is deflected precisely in the direction of a pinhole PH with upstream and downstream pinhole optics PHO for adjusting the beam profile, whereas other possible wavelengths traverse undiffracted in zero order the AOTF and do not reach the pinhole.

[0003] Here the pinhole PH serves simultaneously as an excitation and detection pinhole. By means of scanner units SC1, SC2 and a scanning optics SCO the excitation light is imaged towards a sample in the direction of a microscope beam path M1.

[0004] The light emitted by the sample and comprising fractions of the excitation light and wavelength-shifted fluorescence fractions, passes through the light path in the opposite direction up to the AOTF. By first order diffraction the wavelength fractions of the excitation light once again reach the mirror side S1 of prism PS, whereas the fluorescence fractions traverse the AOTF undiffracted in zero order and consequently assume an angle to the reflected excitation light. Between the returning beams of zero and first order is now precisely located the peak between the prism faces S1 and S2, so that the fluorescence light impinges on side S2 and is reflected by the latter in the direction of a detection unit, here in exemplified manner

comprising a line filter LF, a colour divider NFT and two detectors for different wavelengths.

[0005] As a result of the low AOTF band width of approximately 2 nm for the excitation light it acts as an extreme edge filter with clear advantages compared with dichroic filters with band widths greater than 10 nm.

[0006] This is of particular significance, because the spacing between the excitation wavelength and the fluorescence wavelengths can be smaller than 10 nm and as a result of the arrangement according to the invention a wavelength-dependent separation is still possible.

[0007] By changing the frequency the AOTF can be switched from the wavelength of laser L1 to the wavelength of laser L2 and once again the excitation light can be separated from the fluorescent light.

[0008] In place of the prism with sides S1, S2, it is also possible to use two independent mirrors, which correspond to the sides S1, S2 but which are unconnected. An advantage is that they can also be constructed in rotary manner in order to permit a precise setting to the AOTF or the detection DE.

[0009] Fig. 2 shows a similar arrangement with only a single scanner SC. Here in place of the prism is provided a mirror S, which deflects the excitation light in the direction of the AOTF in the same way as in fig. 1. Here the fluorescent light returning in the zero order through the AOTF passes alongside the mirror S and in this way passes towards a not shown detection.

[00010] Fundamentally arrangements are also conceivable in which the AOTF alone can serve as the separation unit for the excitation light and fluorescent light, in that the laser light passes in the first order direction without an upstream element into the AOTF and the detector light leaves the AOTF at an angle to the excitation light

and passes directly into a detection unit, which only has effects on the length of the construction, because the angle of e.g. 4° is very small and heterodyning of wavelength fractions should be avoided. In addition, a separating mirror may only be provided for the fluorescent light.

[00011] Fig. 3 shows another advantageous construction in the form of an unvapourized prism, which by refraction introduces the light of an excitation laser in the first order into the AOTF and deflects the zero order (fluorescent light) towards the detector DE.

[00012] As a result of the angle between the first and zero orders and different wavelengths in advantageous manner a clear separation of the wavelength fractions is possible.

[00013] The invention can be used with particular advantage in a laser scanning microscope with an AOTF. Other advantageous uses of another light-diffracting element for beam separation by different diffraction orders are conceivable in a microscope beam path and are advantageously included within the scope of the invention.

[00014] Thus it can be used in advantageous manner for regulating the excitation intensity.

[00015] In Fig. 4 several such elements, here AOTF and AOM, are advantageously provided in the laser beam path for feeding in of the laser radiation. Here, several laser lines L1 - L3 like UV, VIS or IR can be fed in simultaneously or individually with an excitation power which can be adjusted independently of each other.

Enclosure 7

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09/857205

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NEW CLAIMS

1. Fluorescence microscope, particularly confocal fluorescence laser microscope,
having a radiation source (L1, L2, L3), particularly a laser emitting excitation light for a sample,
with a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,
having a microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,
having an acousto-optical element (AOM, AOTF) for diffracting excitation light and with which it is possible to regulate an intensity of the diffracted excitation light, being positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1),
   - the emission light emitted by the sample having fractions of excitation light and fractions of wavelength-shifted fluorescence light,
   - excitation light emitted by the sample can be deflected in the direction of the radiation source by the acousto-optical device (AOM, AOTF),
   - and wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light and

- in which the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element such that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical element (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT) and

having a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is located between the acousto-optical element and the detection device (DE, DT, NFT).

2. Fluorescence microscope according to claim 1, characterized in
that at least one optical element influencing the light direction is provided in an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF) for the improved separation of the light fractions.

3. Fluorescence microscope according to claim 2, characterized in
that as the optical element is provided a reflection element (S1, S2, PS, S), particularly a mirror (S), a bimirror (S1, S2) or a vapourized prism (PS).

4. Fluorescence microscope according to one of the claims 2 or 3,
characterized in
that as the optical element or as a further optical element is provided a light refracting element (P), particularly an unvapourized prism (P), which is located in an excitation

beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF).

5. Fluorescence microscope, particularly confocal fluorescence laser microscope,
having a radiation source (L1, L2, L3), particularly a laser, which emits excitation light for a sample,
having a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,
having a microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,
having an acousto-optical element (AOM, AOTF) for diffracting excitation light and which is positioned between the radiation source and microscope optics in such a way that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1),
- the emission light emitted by the sample having fractions of excitation light and fractions of wavelength-shifted fluorescence light,
- excitation light emitted by the sample can be deflected in the direction of the radiation source by diffraction by the acousto-optical device (AOM, AOTF),
- and wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical element (AOM, AOTF)
and is spatially separable from excitation light fractions of the emission light and
- in which the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical element that wavelength-shifted fluorescence light

transmitted undiffracted through the acousto-optical element (AOM, AOTF) can be detected by means of the detection device (DE, DT, NFT),

having a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical element and the detection device (DE, DT, NFT), and

with at least one light reflecting element (P), particularly an unvapourized prism (P), for influencing the light direction and for separating the light fractions and which is located in an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF).

6. Fluorescence microscope according to one of the claims 1 to 5,
characterized in
that in the direction of the microscope optics (SC1, SC2, SCO, M1) as acousto-optical elements (AOM, AOTF) are firstly provided AOM and then AOTF.

7. Fluorescence microscope, particularly confocal fluorescence laser microscope,
having a radiation source (L1, L2, L3), particularly a laser, which emits excitation light for a sample,
having a detection device (DE, DT, NFT) for the detection of emission light emitted by the sample,
having a microscope optics for directing excitation light to the sample and for directing emission light back in the direction of the radiation source and detection device,

having a plurality of acousto-optical elements (AOM, AOTF) for diffracting excitation light, which are so positioned between the radiation source and the microscope optics that diffracted excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1),

- in which in the direction of the microscope optics (SC1, SC2, SCO, M1) as acousto-optical elements (AOM, AOTF) are firstly provided AOM and then AOTF,
- the emission light emitted by the sample having fractions of excitation light and fractions of wavelength-shifted fluorescence light,
- excitation light emitted by the sample is deflectable by diffraction in the direction of the radiation source by the acousto-optical devices (AOM, AOTF),
- and wavelength-shifted fluorescence light emitted by the sample can be transmitted undiffracted through the acousto-optical elements (AOM, AOTF) and is spatially separable from excitation light fractions of the emission light and
- in which the detection device (DE, DT, NFT) is so positioned with respect to the acousto-optical elements that wavelength-shifted fluorescence light transmitted undiffracted through the acousto-optical elements (AOM, AOTF) is detectable by means of the detection device (DE, DT, NFT) and
- with a filter device (LF), which for the selective detection of wavelength-shifted fluorescence light in the detection device (DE, DT, NFT) is positioned between the acousto-optical elements and the detection device (DE, DT, NFT).

8. Fluorescence microscope according to one of the claims 1 to 7,

characterized in
that at least one glass fibre is provided for feeding in excitation light.

9. Fluorescence microscope according to one of the claims 7 or 8,
characterized in
that at least one optical element influencing the light direction is provided in an excitation beam path upstream of the acousto-optical element (AOM, AOTF) and/or in a detection beam path downstream of the acousto-optical element (AOM, AOTF) to bring about improved separation of the light fractions.

10. Fluorescence microscope according to one of the claims 1 to 9,
characterized in that
- the radiation source (L1, L2, L3) is constructed as a plurality of lasers (L1, L2, L3) having a different wavelength,
- a plurality of acousto-optical elements (AOM, AOTF) is provided and with each laser (L1, L2, L3) is associated at least one acousto-optical element (AOM, AOTF),
- the different wavelengths by diffraction in the acousto-optical elements (AOM, AOTF) can be simultaneously or individually fed into a microscope beam path (SC1, SC2, SCO, M1), and
- wavelength-shifted emission light and excitation light having in each case a different wavelength can be transmitted undiffracted through the respective acousto-optical elements (AOM, AOTF).

11. Fluorescence microscope according to one of the claims 1 to 10, characterized in
that as acousto-optical elements AOTF and/or AOM are provided.

12. Fluorescence microscope according to claim 10, characterized in
that the excitation power of each laser (L1, L2, L3) is independently adjustable with the respective acousto-optical element (AOM, AOTF).

13. Fluorescence microscope according to one of the claims 1 to 12,
characterized in
that the acousto-optical elements (AOM, AOTF) by a frequency change can be switched from a first wavelength of a first laser to a second wavelength of a second laser.

14. Fluorescence microscope according to one of the claims 1 to 13,
characterized in
that the excitation light can be introduced into the microscope optics (SC1, SC2, SCO, M1) by diffraction at the acousto-optical element (AOM, AOTF) in the first diffraction order.

15. Fluorescence microscope according to one of the claims 1 to 14,
characterized in
that a pinhole (PH) as the excitation and detection pinhole is located upstream of the microscope optics (SC1, SC2, SCO, M1).

16. Fluorescence microscope according to one of the claims 10 to 15,
characterized in
that the radiation of the plurality of lasers (L1, L2, L3) in the direction of the microscope optics (SC1, SC2, SCO, M1) can be successively fed into the microscope beam path in a sequence based on decreasing wavelength.

17. Fluorescence microscope according to one of the claims 1 to 16,
characterized in
that UV light, visible light and/or infrared light can be fed into the microscope beam path.

18. Device for feeding light into a beam path of a microscope, particularly a confocal fluorescence laser microscope, having a plurality of light sources (L1, L2, L3), which emit light of different wavelengths,
characterized in
that a plurality of light diffracting elements, particularly acousto-optical elements (AOM, AOTF) is provided,
that with each light source (L1, L2, L3) is associated at least one light diffracting element,
that for combining the light of the plurality of light sources (L1, L2, L3) the light diffracting elements are located on a common optical axis and
that the different wavelengths by diffraction in the light diffracting elements can be simultaneously or individually fed into the common optical axis and are combinable in the common optical axis.

19. Device according to claim 18,
characterized in
that AOTF or AOM are provided as light diffracting elements.

20. Device according to claim 19,
characterized in
that as acousto-optical elements (AOM, AOTF) firstly AOM and then AOTF are provided in the direction of the microscope optics (SC1, SC2, SCO, M1).

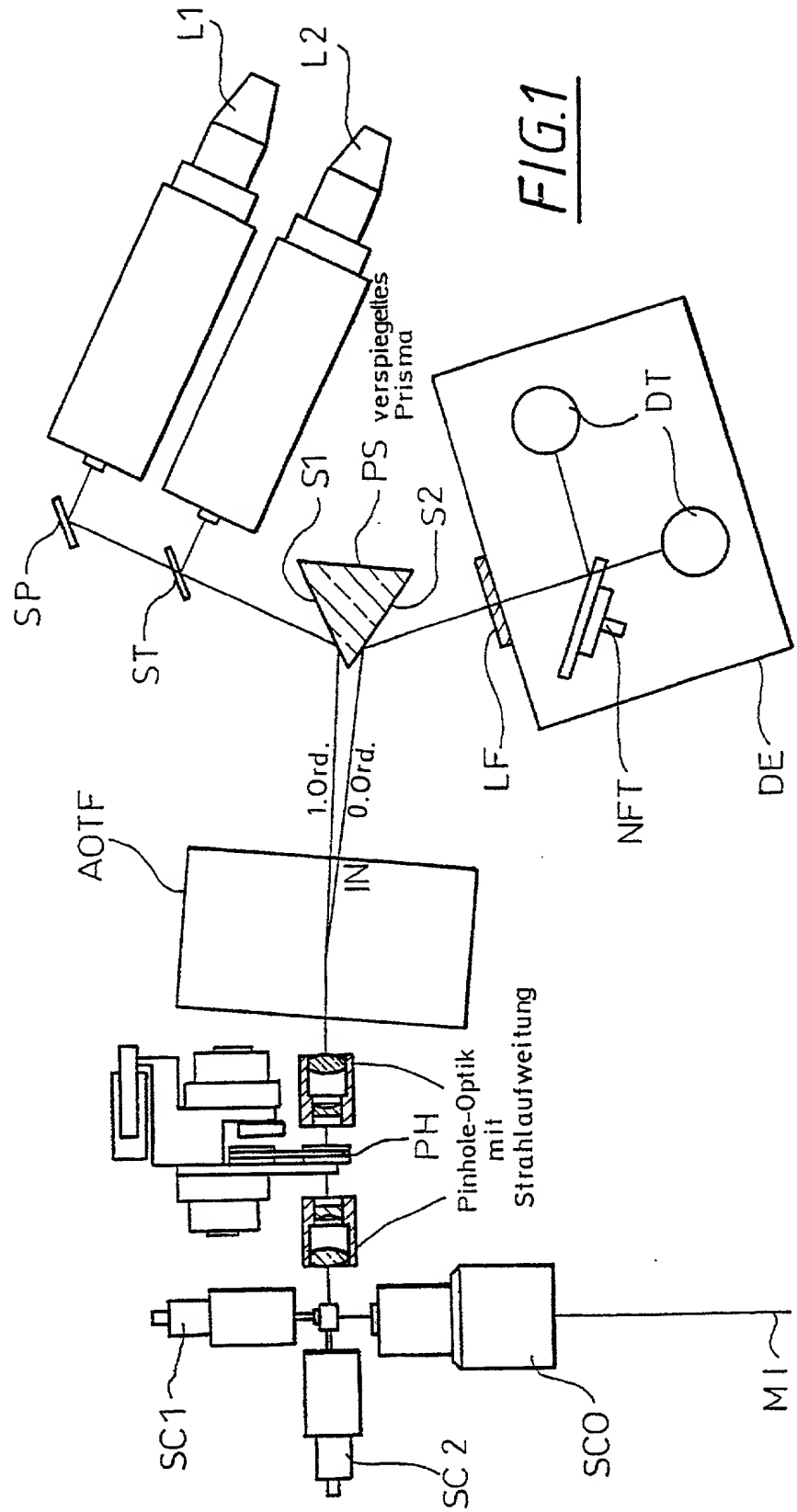
L1
L2
SP
ST
S1
PS
verspiegeltes Prisma
S2
DT
LF
NFT
DE
1.Ord.
0.Ord.
AOTF
IN
PH
Pinhole-Optik mit Strahlaufweitung
SC1
SC 2
SCO
MI

FIG.1

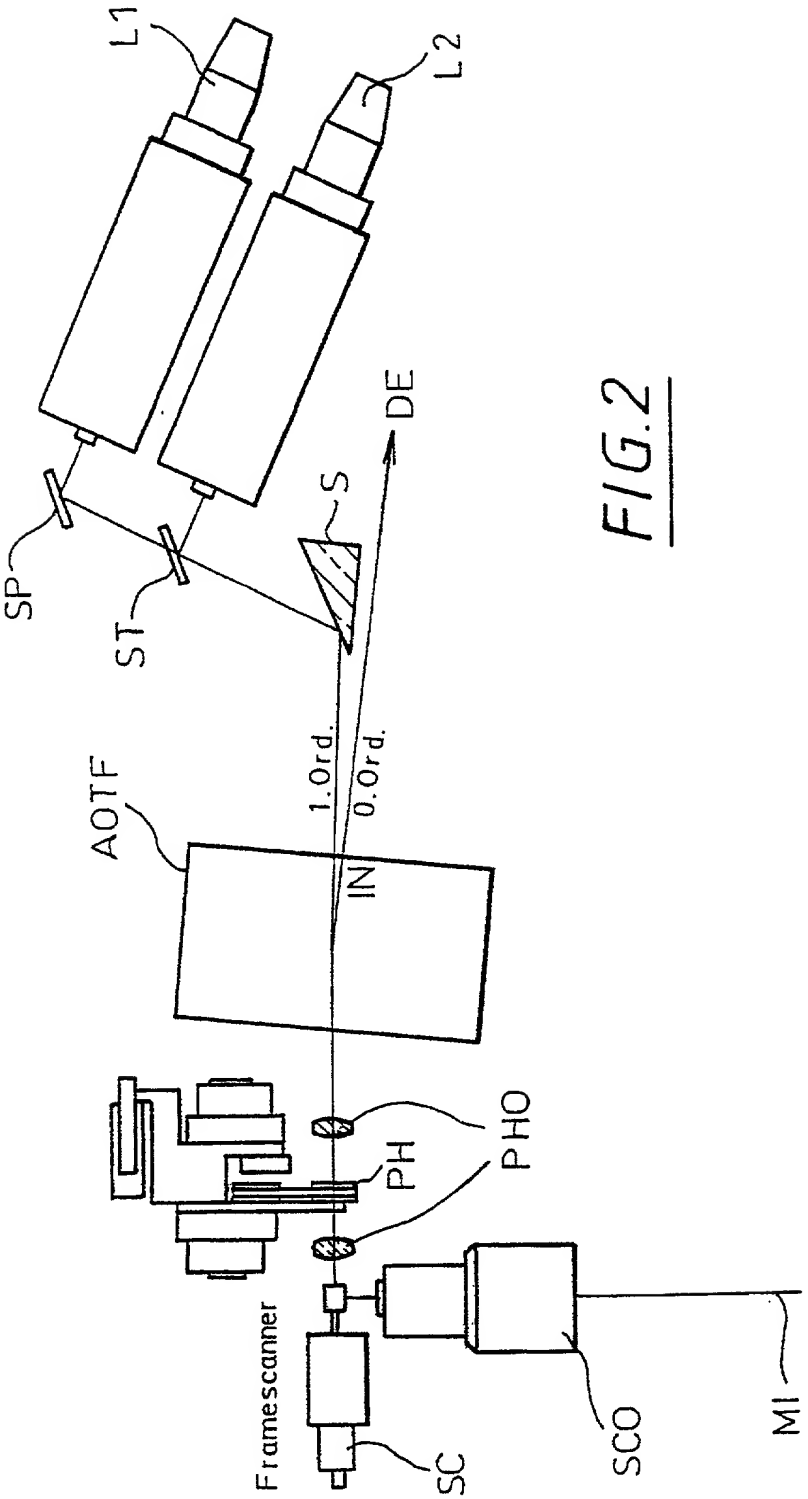

FIG.2

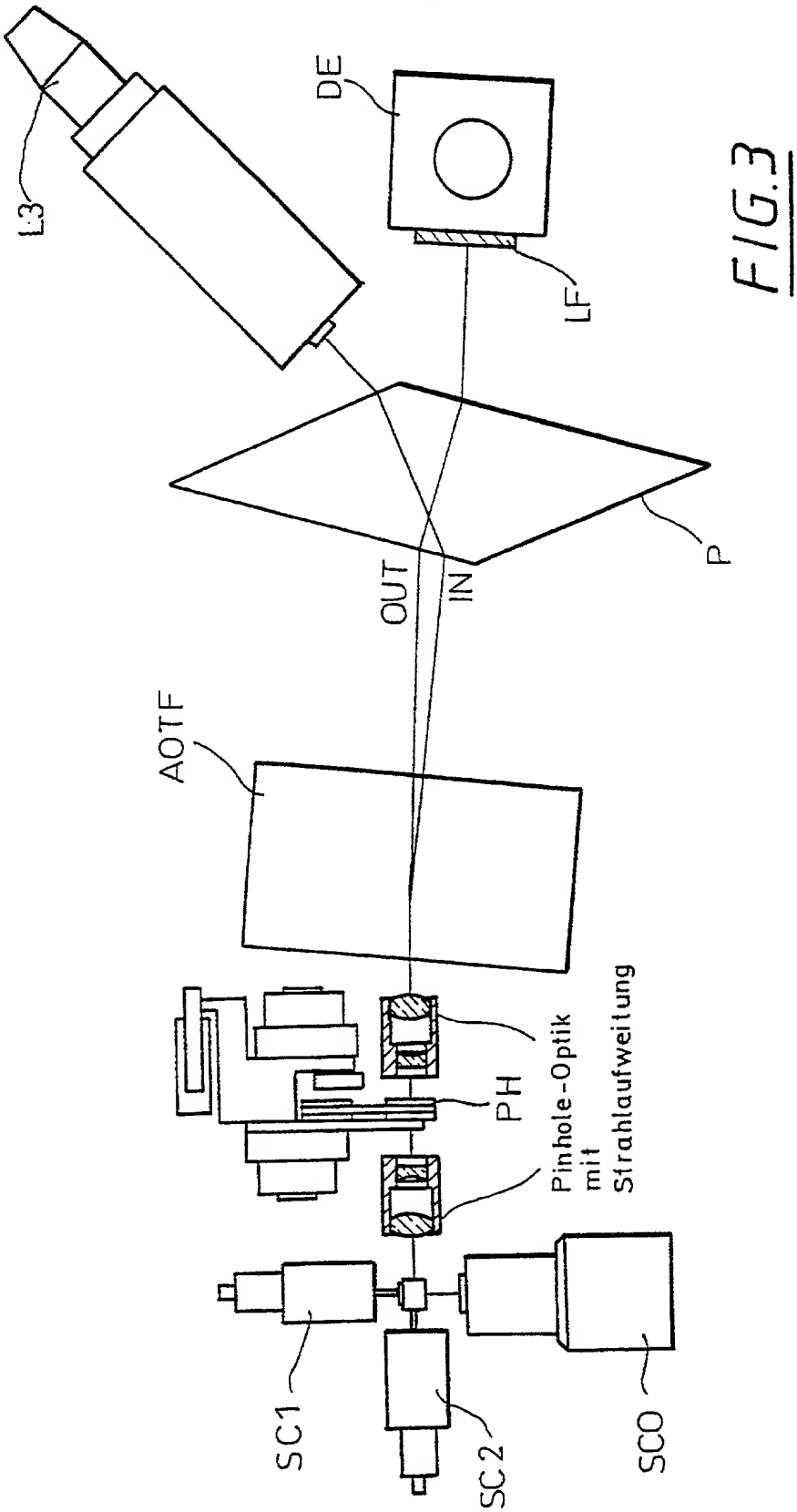
L3
DE
LF
P
OUT
IN
AOTF
PH
Pinhole-Optik
mit
Strahlaufweitung
SC1
SC2
SCO

FIG.3

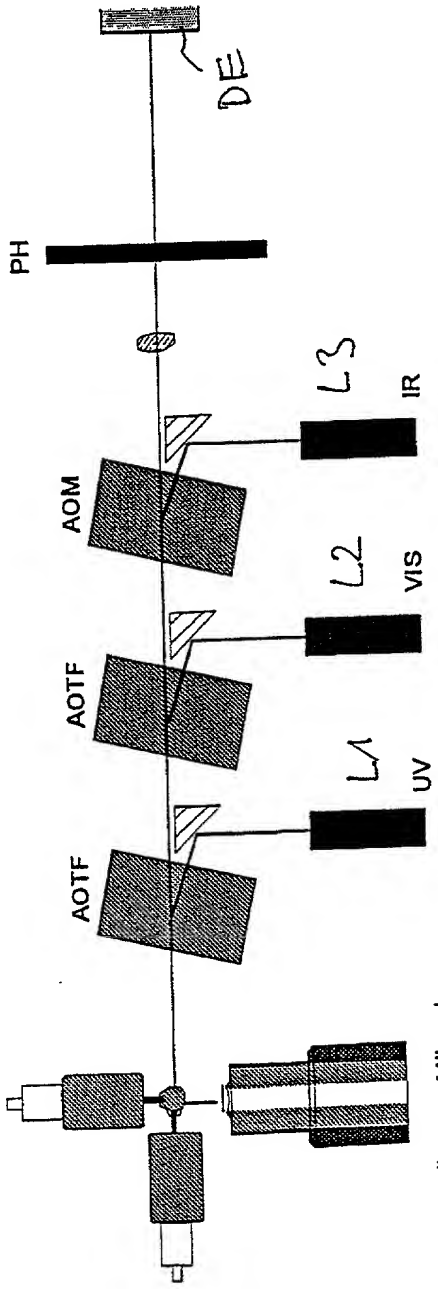

Fig. 4

Anregungslaser - können auch über Glasfaser in das Scanmodul gekoppelt werden.

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DECLARATION AND POWER OF ATTORNEY U.S.A.

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ATTORNEYS' DOCKET NO.

ALL PATENTS, INCLUDING DESIGN
FOR APPLICATION BASED ON PCT; PARIS CONVENTION;
NON PRIORITY; OR PROVISIONAL APPLICATIONS

As a below named inventor, I declare that my residence, post office address and citizenship are stated below next to my name, the information given herein is true, that I believe that I am the original, first and sole inventor (if only one name is listed at 201 below), or an original, first and joint inventor (if plural inventors are named below at 201-203, or on additional sheets attached hereto) of the subject matter which is claimed and for which patent is sought on the invention entitled:

101 102 ARRANGEMENT FOR SEPARATING EXCITATION LIGHT AND EMISSION LIGHT IN A MICROSCOPE

which is described and claimed in:

- [X] PCT International Application No. PCT/EP99/10262 filed Dec. 22, 1999
- [ ] the attached specification
- [ ] the specification in application Serial No. _____ filed _____

(if applicable) and amended on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.
I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.
I hereby claim foreign priority benefits under Title 35, United States Code, §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

103 Prior Foreign Application(s)

(Number)	(Country)	(Day/Month/Year Filed)	Priority Claimed
198 59 314.7	Germany	22/12/1998	[X] Yes [ ] No
199 36 573.3	Germany	03/08/1999	[X] Yes [ ] No
			[ ] Yes [ ] No

104 I hereby claim the benefit under Title 35, United States Code,§119(e) of any United States provisional application(s) listed below:

Application No. _____ Filing Date _____ Application No. _____ Filing Date _____

105 I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status: patented, pending, abandoned)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorneys (Registration No.) to prosecute this application, receive and act on instructions from my agent, and transact all business in the Patent and Trademark Office connected therewith. HARVEY B. JACOBSON, JR. (20,851); D. DOUGLAS PRICE (24,514); JOHN CLARKE HOLMAN (22,769); MARVIN R. STERN (20,640); ALLEN S. MELSER (27,215); MICHAEL R. SLOBASKY (26,421); JONATHAN L. SCHERER (29,851); IRWIN M. AISENBERG (19,007), WILLIAM E. PLAYER (31,409); YOON S. HAM (45,307) and NATHANIEL A. HUMPHRIES (22,772)

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Inventor(s) name must include at least one unabbreviated first or middle name.

201 FULL NAME * OF INVENTOR	FAMILY NAME: WOLLESCHENSKY	GIVEN NAME: RALF	MIDDLE NAME		
RESIDENCE & CITIZENSHIP	CITY: SCHOETEN	STATE OR FOREIGN COUNTRY: GERMANY	COUNTRY OF CITIZENSHIP: GERMANY		
POST OFFICE ADDRESS	POST OFFICE ADDRESS: AN DER PROMENADE 3	CITY: 99510 Schoeten	STATE OR COUNTRY: GERMANY	ZIP CODE: 99510	
202 FULL NAME * OF INVENTOR	FAMILY NAME	GIVEN NAME	MIDDLE NAME		
RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP		
POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE	
203 FULL NAME * OF INVENTOR	FAMILY NAME	GIVEN NAME	MIDDLE NAME		
RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP		
POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE OR COUNTRY	ZIP CODE	

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under section 1001 of Title 18 of the United States Code; and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201*	SIGNATURE OF INVENTOR 202*	SIGNATURE OF INVENTOR 203*
X Ralf Wollenschensky		
DATE June 12, 2001	DATE	DATE

[ ] Additional inventors are named on separately numbered sheets attached hereto.